DOCUMENT RESUME

ED 375 380 CS 011 854

AUTHOR Lott, Pam
TITLE Informational Graphics: Are Non-Lead Visual Displays Beneficial to the Reader?
PUB DATE Aug 94
NOTE 36p.; Paper presented at the Annual Meeting of the Association for Education in Journalism and Mass Communication (77th, Atlanta, GA, August 10-13, 1994). Appendix 2 contains very small print.
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Adults; Color; Higher Education; *Illustrations; *Layout (Publications); Media Research; *Newspapers; Readability; Research Needs; *Text Structure; *Visual Aids
IDENTIFIERS Journalism Research; Pennsylvania (Lehigh Valley); Students as Subjects

ABSTRACT

A study investigated whether informational graphics help attract the reader to a newspaper story, prolong reader interaction, and increase reader knowledge. Five versions of a small informational graphic and a related 10-inch non-lead story published on the bottom of a newspaper page were tested on 300 participants (a non-probability sample of members of the Rotary Club, the League of Women Voters, a student sports group, a senior-citizen craft club, a Christian Bible-study group, and a Jewish synagogue board all from the Lehigh Valley, Pennsylvania area. Results indicated that: (1) color did not make any demonstrable difference in attracting readers to the non-lead story at a higher rate than the non-color versions; (2) all of the versions with informational graphics were better at attracting readers than the text-only versions; (3) readers interacted longest with versions that combined an informational graphic with text; and (4) the student subjects tended to "study" rather than read the story, while the adults in non-school environments were shocked that they had to answer questions about the story. Findings suggest that even an informational graphic alone has the capacity to help readers comprehend more knowledge than the traditional verbal stories, and that researchers should choose samples more representative of the public as a whole. (Contains 8 tables of data and 64 notes. The informational graphic, a sample newspaper page, and three charts of data are attached.) (RS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 375 380

Informational Graphics:
Are non-lead visual displays beneficial to the reader?

Pam Lott
Student Paper
Ohio University

4301 Norma Lane,
Bethlehem, PA 18017
610-865-9806

Paper presented to the Visual Communication Division,
Association for Education in Journalism and Mass Communication,
Atlanta, Georgia, August 1994

CS 011854

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
P. Lott

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

ABSTRACT

Informational Graphics:
Are non-lead visual displays beneficial to the reader?

Now that informational graphics are part of the daily design of newspapers, the industry needs to understand when and how these informational graphics are beneficial to the reader. Few studies have tested reader response to informational graphics presented on typical newspaper pages.

This study was undertaken to find out if informational graphics help attract the reader to the story, prolong reader interaction and increase reader knowledge.

A small informational graphic and a related 10-inch non-lead story published on the bottom of a newspaper page are foci of this study. Because color use in newspaper design is increasing, spot color was also incorporated. Five versions of the page were test on 300 participants.

An unexpected finding is that the color does not make any demonstrable difference in attracting readers to the non-lead story at a higher rate then the non-color versions.

In contrast to the ineffectiveness of color, the findings show that all the versions with informational graphics are better at attracting readers than the text-only version. This may occur because, by the time the readers' eyes travel to the bottom of the page, a break in the text helps to re-interest the readers.

Readers interact longest with versions that combined an informational graphic with text.

Because all versions with informational graphics rate higher in reader comprehension than the text-only version, one can conclude that even an informational graphic alone has the capacity to help readers comprehend more knowledge than the traditional verbal stories.

The research for this study was partially funded by
the Society of Newspaper Design and
the Adams Foundation.

Informational Graphics:
Are non-lead visual displays beneficial to the reader?

Introduction

Informational graphics are being used more often than ever by newspapers to relay statistical information to the reader. Are these informational graphics beneficial to the reader? Is the reader comprehending additional material when an informational graphic is published on a newspaper page?

In a 1984 survey of Society of Newspaper Design members, 60% of the 156 respondents said that their papers increased the use of informational graphics. Another 22% said their newspapers had just begun using informational graphics.[1]

One force behind this trend was the creation of *USA Today*, Gannett's national daily. Every day at the bottom of each section's front page an informational graphic appears in *USA Today's* "USA Snapshots." Along with these four or five consistent positions, informational graphics appear scattered throughout the newspaper.

Informational graphics are not new. *The Times* (of London) used a daily weather map in 1875 and *The New York Times* started publishing a weather map in 1934. Charts and graphs were used on financial pages, but most of the statistical information was published in words.[2]

Most newspaper editors were not aware of the potential of informational graphics until they were used extensively in *USA Today*, explained former *Chicago Tribune* photo/graphics editor Howard Finberg in 1984.[3]

In the survey of Society of Newspaper Design members, the respondents recognized *USA Today's* impact, with 60% stating that their paper had changed because of *USA Today*'s

---

[1] Michael Emery, "New York Times' Tops Designers' List," Advertising Age, 19 November 1984, 36.

[2] Mario R. Garcia, Contemporary Newspaper Design: A Structural Approach (New Jersey: Prentice Hall, 1987),149.

[3]David Astor, "Popularity Rise for Syndicated Graphics," Editor & Publisher, 23 July 1984, 34.

emergence in 1982.[4]

According to a 1986 study on graphics, which examined 30 newspapers published during one week, informational graphics were found to be an important communications element. However, the extent of use was much less than that of *USA Today*.[5] The study found only one graphic was used on every 17th page in most newspapers, in contrast to *USA Today's* count of 1.3 graphics per page.

Personal computers, especially Apple Computer Inc.'s Macintosh, have also led to the explosion of informational graphics by making the creation and distribution of graphics easier and quicker.

The technological advances have revolutionized the industry, allowing newspaper chains to start electronically-based graphics services. Informational graphics are available almost instantly and can be changed to meet the individual newspaper's needs.[6]

In 1987, Associated Press members began directly linking to AP's host computer to get news and weather graphics, which enabled informational graphics to be printed out of computers at the member's site. This improvement enabled better reproduction than when the informational graphics were received over the wire. AP NewsGraphics editor Karl Gude was impressed and excited. In his seven years working at the wire service this was the first time he was able to get quality graphics to the newspapers.[7]

Certainly the increasing demand for informational graphics is changing the way newspapers convey information.[8]

However, concrete evidence that this explosion helps the newspaper reader is scarce.

---

[4]Emery, 36.

[5]Edward J. Smith and Donna J. Hajash, "Informational Graphics in 30 Daily Newspapers," Journalism Quarterly 65 (1988): 718.

[6]George Garneau, "Graphics," Editor & Publisher, 21 March 1987, 46.

[7]George Garneau, "Improving Wire Service Graphics," Editor & Publisher, 21 March 1987, 44.

[8]Garneau, "Graphics", 46.

Few studies have tested reader response to informational graphics presented on newspaper pages. One study by Pegie Stark, associate at the Poynter Institute, tested knowledge gain using full newspaper pages containing a picture, an informational graphic and text.[9] However, the pages were not typical daily newspaper pages. They contained only one story—a major airplane accident—and a column of briefs.

Stark's study, as well as many other studies on informational graphics, have investigated college students' responses. In order for the newspaper industry to apply results to their work, however, a general-population study is needed.

Literature review: a difference of opinion

Thirty years ago, research was undertaken to learn which types of graphs provided more information. In a study done at the University of Wisconsin, bar graphs were found to lead to more comprehension than text or tables.[10]

Another early study done in 1960 found that complexity of design has a high attention-getting value. The research also suggests that novel objects (non-repetitious lines or objects) have high attention-getting power.[11]

Yet, in 1983 Edward R. Tufte published the book, *The Visual Display of Quantitative Information*, in which he intuitively claimed the opposite of the two previous studies. Without performing tests, he declared, "Tables usually outperform graphics in reporting on small data sets of 20 numbers or less."[12] Tufte also asserted that comprehension could be maximized by using

---

[9]Pegie Stark interview by author, Telephone, Poynter Institute, St. Petersburg, Fla., 19 May 1990. Stark presented paper to the Visual Communication Division of the Association for Education in Journalism and Mass Communications in August 1990—author was in attendance.

[10]Gloria Feliciano, Richard Powers, and Bryant Kearl, "Texts, Tables or Graphs?" Departmental Bulletin 32 (Madison: Department of Agriculture Journalism, University of Wisconsin, 1962); cited in Hugh M. Culbertson, "The Effect of Art Work on Perceived Writer Stand," Journalism Quarterly 46, (1969): 294.

[11]D. E. Berlyne, Conflict, Arousal, and Curiosity (New York: McGraw-Hill Book Co., 1960), 38-44.

[12]Edward R. Tufte, The Visual Display of Quantitative Information (Cheshire, Conn.: Graphics Press, 1983), 57.

only the essential core of a graphic, which he labels as data-ink.[13]

He theorizes that non-data-ink clutters up the data. Tufte advocates erasing all the non-data-ink, within reason, because "ink that fails to depict statistical information does not have much interest to the viewer of a graphic." He calls this, boring ink.[14]

He writes the following in his book:

> Just as a good editor of prose ruthlessly prunes out unnecessary words, so a designer of statistical graphics should prune out ink that fails to present fresh data-information.[15]

Tufte advocates wiping out all extra lines until a bar becomes a single line. He considers the other three sides non-data ink.[16]

If the type of pruning Tufte espoused were applied to text, he would delete the humanizing details, which make the story interesting and leave just the basic facts.

If one were to apply his erasing principle to text, he would take a *Miami Herald's* Pulitzer Prize winning story by reporter Edna Buchanan that begins like this:

> Gary Robinson died hungry.
> He had a taste for Church's fried chicken. He wanted the three-piece box for $2.19, plus tax.
> Instead he got three bullets — from a security guard who shot him when he ran. Police jailed the guard on a murder charge.
> Robinson, 32, walked into Church's, at 2701 NW 54th St., on last Sunday at 11:45 p.m., 15 minutes before closing time...[17]

and turn it into:

> A security guard shot and killed a man in Church's restaurant at 2701 NW 54th St. Police jailed the guard on a murder charge.

Fortunately for newspaper readers and graphic artists, recent research on information graphics has not borne out Tufte's assumptions.

James D. Kelly, using a hypothesis developed from Tufte's principle, conducted an experimental test using informational graphics published in *USA Today*. He transformed the visually interesting informational graphics into simple bar charts by eliminating all art

---

[13]Ibid., 93-105. [14]Ibid., 96. [15]I bid., 100. [16]Ibid.

[17] Edna Buchanan, "Security Guard Held for Slaying Man in Restaurant Ruckus," The Miami Herald, 17 March 1985, 1(B). Buchanan is a Miami Herald staff writer who won a Pulitzer for general reporting in 1986.

elements.[18]

A comparison of correct answers between students who saw the graphics with art work and students who viewed the other version without art elements revealed that the number of errors made by each group was nearly the same.

Not being able to convincingly prove his hypothesis, he came to the conclusion that Tufte's perspective is too simplified. Kelly's next approach was to create a graphic with five levels of visual attraction, ranging from simple to complex. Basically, he found none of the levels had a significant effect on recall accuracy.[19]

Prabu David also reported results that contradicted Tufte's theories.[20] He found evidence that some informational graphics that were highly decorated with art work and published by the media cause a distortion of the numbers. However, some of the informational graphics that were selected because of distortion violations—which seemed obvious to David—were found to be perceived as accurately by readers as was the control version (same graph without art work).[21]

The above mentioned studies tested graphs without a complementary verbal story. Seeing the need to incorporate graphics into the newspaper setting, Jyotika Ramaprasad created two versions of a story. One was a verbal, text-only story about the geological explanation of the 1989 San Francisco earthquake. The second combined the verbal text with an informational graphic.[22]

Ramaprasad found the performance of the graphic fell short. No significant difference was found between student sample groups for attention or recall. However, the informational

---

[18] James D. Kelly, "The Data-Ink Ratio and Accuracy of Newspaper Graphs," Journalism Quarterly 66 (1989): 632-639.

[19] James D. Kelly, interview by author, Telephone, Southern Illinois University, Carbondale, Ill., 19 May 1990.

[20] Prabu David, "Accuracy of Visual Perception of Quantitative Graphics: An Exploratory Study," Journalism Quarterly 69 (1992): 273-292.

[21] Ibid.

[22] Jyotika Ramaprasad, "Informational Graphics in Newspapers," Newspaper Research Journal 12 (Summer 1991): 92-103.

graphic did aid recall on specific questions that relied on a highly visual element. [23]

After the field work was completed for this author's study, two relevant reports, which tested knowledge gain, were released. They tested a "sidebar" informational graphic accompanied by a traditional text with results that would surprise practitioners who intuitively conclude that graphs help the reader understand statistical information.

Published during the summer, Douglas B. Ward's findings showed no evidence that sidebar graphics could aid in comprehension more than a sidebar of text would. Five versions of a story package—text alone, text with bar graph, text and table and text with a text sidebar—were read by college students who then completed a questionnaire. The results did suggest a higher accuracy of scores when a redundancy of facts was present.[24]

Recently, Jeffrey L. Griffin and Robert L. Stevenson presented findings from their most recent study titled "The Influence of Statistical Graphics on Newspaper Knowledge Gain." The researchers wanted to determine if an informational graphic could effectively complement or even replace the text.

College students read a sheet, which contained a graphic and/or related news story, and then completed a quiz sheet. The results indicated that putting the statistical information directly into the text of a news story has a greater effect on knowledge of a complex new event than the graphic presentation.[25]

The results also suggested, though not at a statistically significant level, that the redundant technique of putting the facts in both places leads to more knowledge gain than if used only in the text or graphic.[26]

One weakness of most of the research on informational graphics, including the previously

---

[23] Ibid.

[24] Douglas B. Ward, "The Effectiveness of Sidebar Graphics," Journalism Quarterly 69 (1992): 318-328.

[25] Jeffrey L. Griffin and Robert L. Stevenson, "The Influence of Statistical Graphics on Newspaper Reader Knowledge Gain," Paper presented to the Newspaper Division, Association for Education in Journalism and Mass Communication, Montreal, Canada, August 1992.

[26] Ibid.

mentioned, is that they were tested out of context. Even a recent study by Steve Pasternack and Sandra H. Utt,[27] has not tested the knowledge gained or the attention-getting value of informational graphics when they are placed on a newspaper page.

Stark developed one of the first studies to test knowledge gained from informational graphics presented on a newspaper page. She constructed four versions of a black-and-white page where the a lead story was a tragic airplane crash.[28]

One page had text only. The second page had text plus a large informational graphic, which illustrated the path of the plane. The third page had the text with a dominant photograph, and the fourth page had text, a photograph and an informational graphic. Stark found that the accuracy of the recall information by students improved on the page that included all three message elements.[29]

Color, which has become an integral part of newspaper design, is an important factor that has not been considered in informational-graphic studies. *USA Today* not only influenced the use of informational graphics, but it also helped increase color usage. In the Society of Newspaper Design survey, 67% of the respondents said color was increased in their newspaper.[30]

Color usage in the newspaper industry was rising before *USA Today's* appearance. Full color production doubled between 1979 and 1983. With more than half of weekday editions using full color on their front pages, the move has been to carry color to the inside pages.[31]

The Poynter Institute's recent color-research project, conducted by Mario Garcia and Stark, found that readers preferred colorful pages; informational graphics got a high reader

---

[27] Steve Pasternack and Sandra H. Utt, "Reader Use and Understanding of Newspaper Infographics," Newspaper Research Journal 11 (Spring 1990): 28-41. The study sought to discover when readers interact with the graphic (after or before the headline and traditional text) and why readers interacted with the informational graphic. Results suggest readers turn to the graphic for content-based reasons more than appearance-related reasons. Another finding indicated that size of the graphic affects reader use.

[28] Pegie M. Stark and Barry Hollander, "Information Graphics: Do They Help the Reader Understand News Events?" Presented to the Visual Communication Division, Association for Education in Journalism and Mass Communication, Minneapolis, Minnesota, 10 August 1990.

[29] Ibid.

[30] Emery, 36.

[31] M. K. Guzda, "Does your color measure up?," Editor & Publisher, 4 May 1985, 24.

response (only one black-and-white informational graphic was tested).[32]

An 1980 study, by Guido Stempel and J. W. Click, compared readers' preferences of black-and-white newspapers pages to color newspaper pages. The researchers found that readers preferred pages with either spot color or four-color halftones to page without color.[33]

In another newspaper study on reader response to color, conducted in 1987 by Garcia and Robert Bohle, color in newspapers highly affected eye movement. The main photograph on the page was seen first whether it was in color on not. Next, the reader's eyes were most often drawn to spot color or processed color even if it was below the fold.[34]

The bulk of research on color as it relates to the media has dealt with advertising. The findings are important and incorporated into the fourth hypothesis because researchers have found similar results in the way readers perceive color in ads and in editorial content.

Readership of ad copy has been found to increase from 50% to 80% when color is used. However of more significance, several studies, which tested knowledge gain rather than attention, found black-and-white ads surpassed color in the depth of knowledge gained.[35]

Intention and focus

The purpose of this study was to find out if informational graphics help attract the reader to the story more quickly, hold the reader's attention longer and help the reader learn more about the story when placed in the context of a typical newspaper page.

A small informational graphic, published with a 10-inch non-lead story, is the focus of

---

[32] Lynne Peri, "Color Study: The Palette Thickens," Society of Newspaper Design, January/February/March 1991, 21; "Poynter Research Topples Editor's Myths About How Newspapers Are Read," The Poynter Report, Winter 1990-91, 1; "Color Symposium Shows How Real Readers Look at Newspapers," The Poynter Report, Winter 1990-91, 8.

[33] J. W. Click and Guido H. Stempel III, "Reader Response to Front Pages with Modular Format and Color," ANPA News Research Report , no. 35 (1982): 2-5.

[34] Robert H. Bohle and Mario R. Garcia, "Reader Response to Color Halftones And Spot Color in Newspaper Design," Journalism Quarterly 64 (1987): 732.

[35] Michael L. Ray, Alan G. Sawyer and Edward C. Strong, "Frequency effects Revisited," Journal of Advertising Research (February 1971): 14-20; Donald W. Hendon, "How Mechanical Factor Affect Ad Perception," Journal of Advertising Research (August 1973): 39-45.

this study; rather than a large informational graphic published in conjunction with the lead story.

This study tested the attention-getting value, reader interaction and the depth of recall on a sample population more representative of all newspaper readers than are college students.

Taking into account the increased use of color in newspaper design, the study incorporated spot color as a variable.

Hypotheses

This study addressed the question of whether an informational graphic can complement or even supplant text by increasing the attention-getting value of a story, reader interaction (time spent) and the knowledge gained.

Rather than testing this question out of context, the informational graphic was placed at the bottom of a daily-newspaper page to allow the test results to be more more applicable to the newspaper industry.

Five versions of a newspaper page were tested:

V_1 — a stand-alone color informational graphic

V_2 — a color informational graphic with text

V_3 — a stand-alone black-and-white informational graphic

V_4 — a black-and-white informational graphic with text

V_5 — text without an informational graphic

Each of the five versions incorporated several independent variables (see table 1).

Table 1. — Independent-variable manipulations present in each version.

	Independent Variables			
	Text	Graphic	Color	B&W
V_1		x	x	
V_2	x	x	x	
V_3		x		x
V_4	x	x		x
V_5	x			x

Note: x represents variables present.

Based on prior research, the following five hypotheses were made:

H_1 — More readers are attracted to packages that include color (Attn. V_1 > Attn. V_3; Attn. V_2 > Attn. V_4).

H_2 — More readers are attracted to the four packages that include an informational graphic than the text-only package (Attn. V_{1-4} > Attn. V_5).

H_3 — Reader interaction (time spent) is greatest with the packages that present an informational graphic with text (Time Spent V_2 > T.S. V_1; T.S. V_4 > T.S. V_3).

H_4 — The knowledge-gained value (depth of recall) is the highest from the package of black-and-white informational graphic with text (K.G. V_4 > K.G. $V_{1-3,}$ V_5).

H_5 — The knowledge-gained value (depth of recall) is the highest when an informational graphic is present (K.G. V_{1-4} > K.G. V_5).

For each hypothesis, comparisons of independent variables using the various versions were necessary to test the dependent variables (see table 2).

Table 2. — Statement of hypotheses.

Dependent Variables	Hypothesis	Independent Variables		
Attention-getting value	H_1	color V_1, V_2	>	B&W V_3, V_4
Attention-getting value	H_2	graphic V_{1-4}	>	no graphic V_5
Reader interaction	H_3	graphic & text V_2, V_4	>	graphic or text V_1, V_3, V_5
Knowledge gained	H_4	graphic & text & B&W V_4	>	not graphic & text & B&W $V_1, V_2, V3, V5$
Knowledge gained	H_5	graphic V_{1-4}	>	no graphic V_5

Methodology: an experiment

The method to be used in this study is classified as an experiment by Campbell and Stanley's standards because variables are manipulated and effects on other variables observed.[36] This study, like all experiments, has strong control but at the expense of external validity.

However, being able to generalize the findings is very important. This study was undertaken so that the results could be used by the newspaper industry. Therefore the author endeavored to increase this dimension while maintaining the study's precision and control.

Independent variables

The text and the informational graphic, which are the independent factors in this study,

---

[36]Donald T. Campbell and Julian C. Stanley, Experimental And Quasi-Experimental Designs For Research (Chicago: Rand McNally College Publishing Company, 1973), 1.

contained the same facts.

Some journalists believe an informational graphic that is published with a story should not include the same facts as the text.

Conversely, an idea promoted by Ron Couture, former managing art director for *The New York Times*, is that informational graphics should give the reader a reference point, help clarify the information and attract attention. "We feel they [words and graphics] should live together peacefully on the page," he said.[37] The use of informational graphics, which complement the text, revolves around trying to communicate effectively.[38]

The subject of the experimental message in this study was the effects of sidestream cigarette smoke (smoke that comes out of the lit end of a cigarette) on smokers and non-smokers, and related for local employers. This information was chosen so that it would be of interest and have news value to many people.

The text and graphic emphasized how sidestream smoke affects everyone. If only the effects on smokers were addressed, a non-smoker could easily say "I don't smoke; therefore, I didn't read it." The headline conveyed the message of universal application; the informational graphic highlighted the message.

The information for the graphic and text of the smoking story came from an interview with the Lehigh Valley American Lung Association's program director and reports from the Environmental Protection Agency.

When the graphic was produced the following recommendations were considered. To avoid boring, deceptive informational graphics, James Tankard recommends finding a proper balance between being accurate and clear, and being attention-getting and entertaining.[39]

Deception by distortion is one major problem that needs careful monitoring when creating informational graphics.

---

[37]Howard S. Shapiro, "Giving a Graphic Example: The Increasing Use of Charts and Maps," Nieman Reports XXXVI (Spring 1982): 7. Currently Ron Couture is director of NewsVisions.

[38]Ibid.

[39]James W. Tankard, Jr., "Quantitative Graphics in Newspapers," Journalism Quarterly 64 (1987): 408.

Tufte, who is very concerned about distortion that deceives, would not allow three-dimensional charts to be produced.[40] But earlier research has found that a graph with two or more dimensions does not significantly differ in accuracy of reading from a graph with only one dimension. Part of that research, done in 1954, found that foreshortening of a graph did cause a loss in accurate reading.[41]

To err on the safe side, the graph constructed for this study uses only one dimension.[42]

Other research has found recall accuracy higher when identifying labels are on or near elements of graphs than when keys are used for identification; numbers placed directly on graphs result in higher recall accuracy than having the reader estimate quantity by using a grid.[43]

Informational graphics can include an assortment of formats such as charts (used in this study), tables, diagrams and maps. Charts are divided into four basic types: bar chart, fever (line) graph, pie chart and table.

Bar charts emphasize individual figures so as to allow comparison of non-time-related subjects. Fever graphs stress trends and overall flow. Pie charts show parts of the whole (100 percent) and tables, which are not a visualization of statistics, allow large series of numbers to be compared easily.[44]

A bar chart was selected for this study to emphasize the number of people affected by sidestream smoke and allow readers to make comparisons.

Color is another factor that enters into the construction of the informational graphic. One pilot study researched how certain colors in newspapers might affect the reader. Robert Bohle and Mario Garcia found that readers perceived the design to be easier, more important and much

---

[40]Tufte, 53-77.

[41]Lewis V. Peterson and Wilbur Schramm, "How Accurately are Different Kinds of Graphs Read?" Audio Visual Communication Review 2, No. 3, (Summer 1954): 184-85.

[42] See appendix 1 for informational graphic used in study.

[43]Hugh M. Culbertson and Richard D. Powers, "A Study of Graph Comprehension Difficulties," Audio Visual Communication Review 7, No. 2, (Spring 1959): 106-107 .

[44]Nigel Holmes, Designer's Guide to Creating Charts & Diagrams, (New York: Watson-Guptill Publications, 1984), 22-60.

more believable when certain spot colors were used.[45] Nevertheless, Garcia and Bohle admit: "We know very little for certain about how people react to color."[46]

Garcia does point out that continuity is part of the power of color.[47] By using color even the simplest bar chart can be turned into statistical art.[48] Color can be also be used to move the reader through a page and to tie the elements on the page together. Ultimately, color should make the communication process more effective.[49]

Prototype construction

Prototype pages, with stories and visuals created specifically for the page, were designed and printed to avoid skewing of the test results. If the readers had seen stories, which had already been published in their local newspaper, the results might have been affected in an immeasurable way.

Stories from the Associated Press and the Press & Sun-Bulletin, Binghamton, NY, were altered by adding local names and sites. The photographs on the page were borrowed from photographers working outside the area.

The entire page remained the same in every edition, including spot color, except for the area containing the sidestream informational graphic and related text. The sidestream-smoking package was kept in the same position in all the editions, with the informational graphic and the text remaining at a consistent size.

The smoking package was downplayed at the bottom of the page rather than in a lead-story style. Recent studies, including one using eye tracking by Stark and Garcia,[50] have found

---

[45]Bohle and Garcia, 739.

[46]Mario R. Garcia and Don Fry, Color in American Newspapers, (Florida: The Poynter Institute for Media Studies, 1986), 43.

[47]Mario R. Garcia, Newspaper Colour Design, (Federal Republic of Germany: INCA_FIEJ Research Association, 1989), 141-149.

[48]Garcia and Fry, 54.

[49]Garcia and Fry, 51-54.

most readers automatically enter the page at a dominant visual element (i.e. photograph, large headline or graphic) regardless of whether it is in color or not.[51] This tendency needs to be avoided in this study if the informational graphic is to have maximum impact.

In the versions without an informational graphic a small feature photograph with three paragraphs of text was substituted. For the version without the text on sidestream smoke an unrelated text-only story was substituted.

No other informational graphic was used on the pages. A dominant, color, fire photograph with a related story was placed in the lead position.

To help the reader feel comfortable with the newspaper, the pages were modeled after the design of local papers. However, the nameplate was fictitious so responses would not be based on attitude toward the local papers.[52]

Dependent variables

The dependent variables, attention-getting value, reader interaction (time spent) and the knowledge gained (depth of recall), were tested with a self-administered questionnaire.

The attention-getting value of an informational graphic is the point at which the subject makes the first contact with the smoking story during the viewing of the entire page.

To test the attention-getting value, the subjects were asked to list the items they recalled seeing, reading or examining on the page. Next, they were asked to rank the elements in the order in which they encountered them. When any element of the side-stream smoke package was not listed but the subject circled yes when directly asked if they read/examined the report a ranking of 12 was assigned. When the side-stream smoke package was not listed and the subject circled no, then 13 was assigned.

The total mean scores from ranking of individuals for each package were compared in order to evaluate which package had the highest reader interaction. Analysis of variance

---

[50]Mario R. Garcia and Pegie Stark, Eyes on the News, (Florida: The Poynter Institute for Media Studies, 1991), 26-37.

[51]Bohle and Garcia, 739; Garcia and Stark, 26-7.

[52]See appendix 2 for sample of newspaper page design.

(ANOVA) was used to find out if the differences were statistically significant or were likely to have occurred by chance. The test assumes the following and was met by this study: equal size sample groups, homogeneity of subgroups, similar distribution of scores from within each group, and interval measurement.

The second dependent variable, reader interaction (time spent) was tested by asking the subjects to estimate the time (minutes and seconds) they spent reading/examining each item they had previously listed. When the smoking report was not listed (regardless of whether the subject answered when asked if they read/examined the side-stream smoke package), the amount of time was recorded as zero.

Total mean scores for each package were compared to find which package had the highest reader interaction. ANOVA was used to test whether the differences were statistically significant or occurred by chance.

To help define the third dependent variable, the knowledge-gained value, which is tested through the depth of recall, a look at a psychologist's definition of knowledge is appropriate. Behavior theorists regard knowledge as having three levels. To possess knowledge can mean that a fact influences behavior through the excitation of receptors and sensory nerves. At a second, higher level, knowledge is synonymous with information as when a thermostat knows the temperature. The third level, which is to be tested, involves a highly-specialized process of information gathering and information storing.[53]

The knowledge-gained value was measured by asking the subjects who circled yes when directly asked if they read or examined the sidestream smoke package (even partially) to answer nine multiple-choice questions that tested fact recall, comparison of sidestream smoke risks and understanding of the story.

Each question had five answers from which to choose with the last one being "cannot recall." The subjects were also asked not to guess at any answers but to mark the appropriate answer based on what they had learned from the prototype newspaper.

---

[53]D. E. Berlyne, 42.

The level of difficulty of the questions varied. After the pretest, the questions were selected ranging from simple to difficult. The pretest, which weeded out double-barreled and confusing questions, was conducted with a sample of 50 people, primarily students from Lehigh University.

Each subject's correct answers were totaled for individual scores. Subjects who circled no when directly asked if they had read or examined the package were assigned a score of zero.

The scores were statistically tested using ANOVA, which permits testing of interaction effects and helps assess the ability to generalize.

Sample composition

Five versions of the prototype page were read by 300 people. The study used a non-probability sample. The recruited subjects covered a broad base of the selected community.

The subjects for the study live in the Lehigh Valley (a conglomeration of three cites—Allentown, Bethlehem and Easton—and the surrounding suburbs) located in eastern Pennsylvania. The population recorded in the 1980 census was 551,052 for the standard metropolitan statistical area of Allentown, Bethlehem and Easton. The census figures for 1990 show an 1.2 percent increase in the downtown areas with some of the suburbs growing by nearly 20 percent. The Lehigh Valley is the third largest metropolitan area in the state of Pennsylvania (trailing Philadelphia and Pittsburgh).[54]

For the desired sample size 15 groups with an average of 20 people in each were solicited by mail from a master list of local clubs and organizations. The author requested time to speak about her thesis, which she explained was about newspaper readers. Test groups included the Rotary Club, the League of Women Voters, a student sports group, a senior-citizen craft club, a Christian bible study group, and a Jewish synagogue board.

In addition to testing the dependent variables, the questionnaire recorded the subjects' ages, genders, occupations, newspaper reading habits and newspaper buying habits.

---

[54]"Bethlehem got bigger during the '80s," The Globe-Times (Bethlehem) 26 January 1991, 1-2 (A).

Test administration

At each gathering, the researcher handed out the newspaper pages, which had been stacked randomly in advance by using the throw of dice. After a short introduction, the subjects were asked to read the newspaper page as they normally would read a newspaper—taking as little or as much time as they usually do. When the subjects finished the page to their satisfaction, they were asked to fold the newspaper so they could not read it any longer.

Next, the subjects were asked to complete the questionnaire, which had been designed to look more like a handout than a questionnaire. After the task was completed, the subjects were debriefed and questions were fielded. Often, a lively discussion of newspaper practices ensued.

The results: the effects upon the reader

Sample description

To increase the ability to generalize the author sought a sample fairly representative of the community as a whole.

The average age of the 300 participants was 44. They reported reading a newspaper nearly 5.5 times (average) a week; however, they reported buying a newspaper 4.75 times a week.[55]

Of the 300, 107 were female and 193 were male. Overall, about 95 percent of the participants were white and 5 percent nonwhite, reflecting the actual percentage breakdown for the Lehigh Valley.[56]

Nearly 72 percent reported that they were currently employed, most in professional positions, such as pediatricians and administrative assistants.

---

[55]See appendix 3 for charts showing detailed breakdown.

[56]Department of Commerce, Economics and Statistics Administration, Bureau of the Census, 1990 Census of Population and Housing, (Washington, DC., Aug. 1991).

Experimental findings

For the findings to support the first hypothesis (H_1), which states that more readers are attracted to packages that include color, the versions with color must have a higher attention-getting value than the equivalent non-color versions.

The ranking of the attention-getting value had a possible range of 1 to 13 with the lowest numbers being the highest in attention-getting value.

The means (see table 3), which show the effects of each version independently, suggest the versions with color (V_1 & V_2) did not attract more readers than the versions without color.

For the second hypothesis (H_2), the means (see table 3) suggest that the four versions with informational graphics are more likely to attract readers than the text-only control (V_5).

Table 3. — Mean attention-getting value in treatment groups.

	Color Present	Color Absent	Total
Text Present	6.53 (V_2) n=60	6.88 (V_4) n=60	6.705 n=120
Text Absent	8.17 (V_1) n=60	7.58 (V_3) n=60	7.875 n=120
Total	7.35 n=120	7.23 n=120	

Control (V_5) mean = 9.35

Note: The lower the mean the higher the attention-getting value is.

For the first hypothesis, which predicted more readers would be attracted to packages that included color, ANOVA (see table 4) found the difference in the means to be statistically non-significant. Surprisingly, color did not make any difference in the attention-getting value.

The ANOVA confirmed that the four informational-graphic versions are better able to attract readers than the text-only control, thereby confirming the second hypothesis.

Table 4. — ANOVA of attention-getting value.

Source	SS	DF	MS	F	P
Text	81.67	1	81.67	4.22	.05
Color	0.82	1	0.82	0.04	nsd
Text & Color	13.07	1	13.07	0.68	nsd
All vs Control	203.36	1	203.36	10.52	.01
Error	5703.68	295	19.33		

Note: Control is the no graphic, text-only version.

The third hypothesis (H_3) states that reader interaction (time spent) is greatest with the packages that present an informational graphic with text (V_2 & V_4). The means for reader interaction (see table 5) are the highest when text is present with an informational graphic, confirming H_3.

Table 5. — Mean statistical reader interaction.

	Color Present	Color Absent	Total
Text Present	44.27 (V_2) n=60	69.58 (V_4) n=60	56.925 n=120
Text Absent	21.02 (V_1) n=60	23.57 (V_3) n=60	22.295 n=120
Total	32.645 n=120	46.575 n=120	

Control (V_5) mean = 35.38

Note: A high mean translates into longer reader interaction.

The results for text vs non-text treatment are clear and confirmed by ANOVA (see table 6) supporting in H_3. Readers interact longer with the versions that combine an informational graphic with text than with the informational graphic or text alone.

Table 6. — ANOVA of reader interaction.

Source	SS	DF	MS	F	P
Text	71968.07	1	71968.07	12.57	.01
Color	11648.27	1	11648.27	2.03	nsd
Text & Color	7774.82	1	7774.82	1.36	nsd
All vs Control	777.63	1	777.63	0.14	nsd
Error	1689120.62	295	5725.83		

Note: Control is the no graphic, text-only version.

The means (see table 7) suggest the fourth hypothesis (H_4), which states that the knowledge-gained value is the highest from the package of black-and-white informational graphic with text (V_4), is not correct, because the mean for V4 is not higher by a significant amount.

The final hypothesis states that the knowledge-gained value (depth of recall) is the highest when an informational graphic is present. A comparison of the means (see table 7) from V_{1-4} with the V_5 suggests that the packages with an informational graphic all have a higher knowledge-gained value than the text-only control (H5).

Table 7. — Mean statistical knowledge-gain value

	Color Present	Color Absent	Total
Text Present	2.90 (V_2) n=60	2.92 (V_4) n=60	2.91 n=120
Text Absent	2.50 (V_1) n=60	2.38 (V_3) n=60	2.44 n=120
Total	2.70 n=120	2.65 n=120	

Control (V_5) mean = 1.95

Note: Zero is the lowest value; nine is the highest.

The results of the ANOVA (see table 8) show that the only significant finding for the means comparison is that the versions with informational graphics have a higher knowledge-gained value than the control of text-only. The fifth hypothesis is supported, but the fourth hypothesis is not confirmed.

Table 8. — ANOVA of knowledge-gain value.

Source	SS	DF	MS	F	P
Text	13.07	1	13.07	2.26	nsd
Color	0.15	1	0.15	0.03	nsd
Text & Color	0.27	1	0.27	0.05	nsd
All vs control	25.23	1	25.23	4.36	.05
Error	1708.02	295	5.79		

Note: Control is the no graphic, text-only version.

Discussion

One unexpected finding was that color did not make a difference as to the attention-getting value. Previous studies have found that color has attracted the reader. Garcia and Bohle

reported that the main photograph on the page was seen first, then the reader's eyes were most often drawn to spot or processed color even if it was below the fold.[57]

In this study a dominant color photograph was placed in a lead position while the informational graphic was positioned at the bottom of the page. Nearly every person tested in this study noted that they were attracted to the dominant photograph and accompanying text first, but the findings show that the presence of color did not attract readers to the non-lead story on the bottom of the page at a higher rate then the non-color versions. These results contradict Garcia and Bohle's early findings by suggesting that color does not have a strong effect on the variables studied when used in a non-lead position.

In the book *Color in American Newspapers*, Garcia offers tips for designing with color and promotes the concept that color can move the reader's eyes through a newspaper page.[58] This study's finding suggests that color alone cannot stand up to the reputation Garcia and others have given it.

In contrast to the ineffectiveness of color, the findings confirming the second hypothesis show that the attention-getting value was higher when an informational graphic was present on the page. The informational graphic may have influenced the attention-getting value, because by the time the readers' eyes traveled to the bottom of the page, a break in the text helped to re-interest the readers. It is important to design such breaks into newspaper pages to give readers a new point of entry into the text.

Interestingly, the means of the attention-getting value (see table 3) indicate that the versions combining text and graphics have the highest attention-getting value.

Results from ANOVA (see table 4) confirm what is suspected from the table of means, that an informational graphic with text ranks higher in attention-getting value than an informational graphic without text.

Perhaps it is the size of the package rather than color that attracts readers. Because color

---

[57]Robert H. Bohle and Mario R. Garcia, 732.

[58]Garcia and Fry, 50-9

is often used with stories that are given the most space, researchers and practitioners have been led to believe that color plays the most important role in attracting readers to specific stories.

Future studies that not only measure the value of color but also include the total space allotted to individual stories should be attempted. Such studies would begin to sort out which variables, space or an interaction of both color and space, are the strongest at attracting readers.

If space plays an important role, then newspaper editors will need to adjust their designs so that stories are given appropriate space on a page based on their importance. This would also mean editors should be more discreet in the use of photographs, which are often sized for layout purposes (helping break up gray text), often disregarding the importance of the story.

Even though the ANOVA found that the means of the fourth hypothesis did not differ at a statistically significant level, the fact that the black-and-white informational graphic with text resulted in the highest knowledge-gained value mirrors the findings in studies on advertising research,[59] which have found higher depths of recall in black-and-white ads over color.

If further research was to support the concept that black-and-white packaging increases the knowledge gained by the reader, then researchers such as Ron Smith, who found that readers (students) reported that newspapers using color were trustworthy, professional and accurate,[60] will need to adjust their recommendations from telling editors to use more color to advising them to take a more conservative approach.

An increase in the knowledge gained may occur, because whether trustworthy or not, readers accept the black-and-white versions as being more serious and, therefore, put more effort into understanding the article. Of course, researchers need to study the knowledge gained more thoroughly before any definite conclusions can be drawn.

Another finding in this study (see table 7) suggests that combining a textual story with an informational graphic—redundancy of facts—aids in raising the knowledge-gain value. These

---

[59]Michael L. Ray, Alan G. Sawyer and Edward C. Strong, 14-20; Donald W. Hendon, 39-45.

[60]Ron F. Smith, "How Design & Color Affect Reader's Judgment of Newspapers," Newspaper Research Journal 10 (Winter 1989): 75-85.

results support last summer's findings by both Ward, and Griffin and Stevenson.[61]

Although the redundancy of including information in both the text and an informational graphic led to a high mean in this study, the interaction was not at a statistical significant level.

Unlike the two recent studies, however, more than just the redundancy-of-fact effect is occurring in the knowledge-gained portion of this study. With all four versions scoring higher than the text-alone version, one must conclude that even an informational graphic alone has the capacity to help readers comprehend more knowledge than traditional verbal stories.

The textual listing in the informational graphic may have helped the readers by giving them a quick "at a glance" presentation of the information, which led to a less complex and easier understanding of the facts. One of the questions, however, forced the readers to make a comparison of two bars graphs. While the information was present in the facts of the text, readers of the informational-graphic versions got the answer correct more often than readers of the text-only version, suggesting informational graphics aid in complex, relational interpretation.

Newspaper editors are concerned that people are citing lack of time as a major reason for stopping subscriptions.[62] "While they (regular readers) might recognize the informational and utility value of regular newspaper readership, their job duties, parenting time pressures or recreational desires cut down on available reading time," wrote assistant managing editor Ken Gepfert and editor Richard Oppel of *The Charlotte Observer*.[63]

Since informational graphics, alone or with text, help the readers gain the same amount of information more quickly, the newspaper editors should impress upon reporters the importance of recognizing when information in their stories would be better communicated in graphic form rather than by text. To become well-equipped at identifying when verbal should be visual—beyond the obvious numerical tables—takes training, support from editors and time; but, it is

---

[61]Ward, 318-328; Griffin and Stevenson.

[62]Karen Jurgensen, "Newspapers and Baby Boomers," The Next Newspapers (Washington, DC.: American Society of Newspaper Editors, April 1988), 12-13.

[63]Ken Gepfert and Richard Oppel, "The competitive Environment," The Next Newspapers (Washington, DC.: American Society of Newspaper Editors, April 1988), 52-3.

necessary if newspapers are to compete for their readers' valuable time.

Another factor that plays an important role in the differences found between this study and most other informational graphic studies[64] is that other studies used students as subjects.

In the pretest done for this study, students were also the subjects. Through the experience, this author found that students—even when told they were not being tested—tended to "study" rather than read the story. When this studies' larger sample, which was made up of people who were not in a school environment, read the prototype newspaper; they were shocked to find that they had to answer questions about the stories.

Debriefing the non-students took more care. The students knew they would not be graded and therefore tended not to get frustrated when they could not answer the questions. The non-student needed to be told repeatedly, however, that the newspaper page was being tested—not the reader.

Because students, who report reading newspapers less than the older non-student, approach experiments like a test, results of previous studies may have been skewed. No matter which version they received, student made sure they learned as much as they could as fast as they could—the same approach they take every day for their classes.

In contrast, the people who were part of the main body of this study tended to try to read the newspaper as they normally would. Some people glanced at the pages and then put the paper down. They reported afterwards that they normally spend only a few minutes reading their entire newspaper.

Studies where the emphasis is on testing recall, comprehension and knowledge gain may be more vulnerable to skewing when students are used than studies in which the content is not affected by college test-taking habits. Most research on informational graphics has used students mainly because students are easy for academicians to recruit. This author suggests that researchers choose samples more representative of the public as a whole.

---

[64]Ward, 318-328; Griffin and Stevenson; Stark and Hollander; Kelly, 632-639.

Summary

As informational graphics enter into the daily designs of newspapers to relay information, the industry needs to understand when and how these informational graphics are beneficial to the reader.

Few studies have tested reader response to informational graphics presented on newspaper pages. One study, completed about three years ago, found that the accuracy of the recalled information improved when the page contained a picture, an informational graphic and text. The pages were not typical daily newspaper pages, however, because they contained only one story and a column of briefs.

The above study as well as most other studies on informational graphics used college students to make up the sample group. A sample more representative of the public as a whole was needed to be more in line with the general newspaper reader.

The purpose of this study was to find out if informational graphics help attract the reader to the story more quickly (attention-getting value), hold the reader's attention longer (reader interaction) and help the reader learn more about the story (knowledge gained) on a newspaper page.

A small informational graphic published with a 10-inch non-lead story about the effects of sidestream smoke was the focus of this study, rather than a large informational graphic published in conjunction with a lead story.

The stories and visuals were created specifically for the page so that the readers would not have been exposed to any of the stories through the local media. The entire page remained the same except for the area containing the informational graphic and text package. Each of the following versions of the package was inserted at the same position in all the editions:

a stand-alone color informational graphic

a color informational graphic with text

a stand-alone black-and-white graphic

a black-and-white informational graphic with text

text without an informational graphic

The package was placed at the bottom of the page rather than in a lead story position because studies, including a recent one using eye tracking equipment, have found most readers automatically enter the page at this location.

Before the field work began the following hypotheses were made:

H_1 More readers are attracted to packages that include color.

H_2 More readers are attracted to the four packages that include an informational graphic than the text-only.

H_3 Reader interaction is greatest with the packages that present an informational graphic with text.

H_4 The knowledge-gained value is the highest from the package with a black-and-white informational graphic and text.

H_5 The knowledge-gained value is highest when an informational graphic is present.

The subjects, who were tested using a self-administered questionnaire, were recruited to cover a broad base of the local community in the Lehigh Valley, which is the third largest metropolitan area in the state of Pennsylvania.

For the desired sample size, 15 groups with an average of 20 people were solicited by mail from a master list of local clubs and organizations.

The average age of the 300 participants was 44. They reported reading a newspaper nearly 5.5 times (average) a week, however, they reported buying a the newspaper 4.75 times a week.

About 95 percent of the participants were white and about five percent were non-white, which reflects the actual percentage breakdown for the Lehigh Valley.

For each hypothesis, the total mean scores were compared and then an analysis of variance was used to find out if the differences were statistically significant or had occurred by chance.

The result showed that the first hypothesis was incorrect. Color did not make any demonstrable difference in attracting readers to the package.

ANOVA did confirm that the second hypothesis was correct. All the versions with informational graphics were better at attracting readers than the text-only version.

Readers were found to interact longer with versions that combined an informational graphic with text, verifying the third hypothesis.

The means for the fourth hypothesis were not significantly different even though the black-and-white informational-graphic with text version did have the highest mean for the knowledge-gained value.

Because all the versions with informational graphics rated higher than the text-only version, the fifth hypothesis was supported.

One unexpected finding was that color did not make a difference as to the attention-getting value. Previous studies have found that color has attracted the reader. Nearly every person tested in this study noted that they were attracted to the dominant color photograph and accompanying text first, but the findings show that the presence of color did not attract readers to the non-lead story on the bottom of the page at a higher rate then the non-color versions. These results contradict early findings by suggesting that color does not have a strong effect on the variables studied when used in a non-lead position.

In contrast to the ineffectiveness of color, the findings confirming the second hypothesis show that the attention-getting value was higher when an informational graphic was present on the page. The informational graphic may have influenced the attention-getting value, because by the time the readers' eyes traveled to the bottom of the page; a break in the text helped to re-interest the readers. It is important that designers create newspaper pages that give readers many visual breaks and invitations to reenter the text.

Interestingly, the means and ANOVA confirmed that the versions combining text and graphics have the highest attention-getting value. Possibly, the size of the package rather than color may attract readers, but such an implication requires verification and a follow-up study is in order.

With other findings demonstrating that all four informational graphic versions scored higher than the text-alone version, one must conclude that even an informational graphic alone has the capacity to help readers comprehend more knowledge than the traditional verbal stories.

The textual listing in the informational graphic may have helped the readers by giving them a quick "at a glance" presentation of the information, which led to a less complex and

easier understanding of the facts. For one of the questions, however, some of the readers were forced to make a comparison of two bars in the graph. The readers with the informational graphic got the answer correct more often than those readers who were presented the information as a fact in the text. These results suggest informational graphics aid in complex, relational interpretation.

Since informational graphics, alone or with text, help readers gain the same amount of information more quickly, reporters should learn to recognize when information is better communicated in graphic forms than by text.

One final issue that researchers must be concerned with is that studies with an emphasis on testing recall, comprehension and knowledge gain are more vulnerable to skewed results when students are used than studies in which the content is not affected by college test-taking habits.

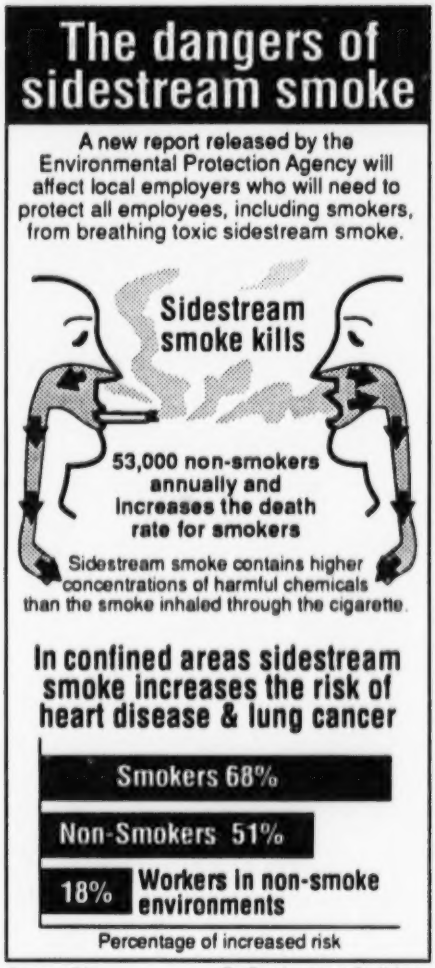
Students were used in the pretest of this study and even when told they were not being tested, they "studied" rather than read the stories. In contrast, the people who were part of the main body of this study tended to read the newspaper as they normally would. Some people, who glanced at the pages and then put the paper down, reported afterwards that they normally spend only a few minutes reading their newspaper and were shocked that they were questioned about content.

Researchers need to choose samples more representative of the public as a whole when they study skills related to test taking such as comprehension.

APPENDIX 1

Informational Graphic

Below is the black-and-white version of the informational graphic (100 percent) that was placed on the bottom of the newspaper page.


The dangers of sidestream smoke
A new report released by the Environmental Protection Agency will affect local employers who will need to protect all employees, including smokers, from breathing toxic sidestream smoke.
Sidestream smoke kills
53,000 non-smokers annually and increases the death rate for smokers
Sidestream smoke contains higher concentrations of harmful chemicals than the smoke inhaled through the cigarette.
In confined areas sidestream smoke increases the risk of heart disease & lung cancer
Smokers 68%
Non-Smokers 51%
18%
Workers in non-smoke environments
Percentage of increased risk
Source: EPA
By Cari Lauden / Staff Artist

APPENDIX 2

Newspaper Page

Below is one version (reduced) of the newspaper page, which was used in this study. Color positions that remain constant throughout are noted. This version of the page includes both the textual story and the black-and-white informational graphic.

Community

The Daily Reporter

Jury to deliberate in rape trial / 2B
Bethlehem Council rejects Muslikfest regulations / 3B
Minister denies wrong doing / 2B

Morning blaze levels Hellertown home

Help us track the stench; dial in when your nose is offended

History can be found in a shoebox

"I never get tired of postcards, although sometimes I get to the point where I'll say I don't want to see another postcard for at least an hour."

Peace Corps seeks lost youth

Sidestream smoke endangers smokers along with nonsmokers

The dangers of sidestream smoke

The word "community" and the 12 pt banner line are blue.

The large photograph of the house on fire is process color.

The 4 pt. rule on the bottom is blue.

BEST COPY AVAILABLE

APPENDIX 3

Charts

The following charts show detailed breakdowns of the participants' newspaper reading habits and employment status.